DOCUMENT RESUME

ED 268 492 CS 008 385

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TITLE Development of Reading Skills in Dutch Primary Schools: Outcomes and Prospects.
PUB DATE Apr 86
NOTE 22p.; Paper presented at the Annual Meeting of the American Educational Research Association (70th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Child Development; Decoding (Reading); Elementary Education; Foreign Countries; Integrated Activities; Longitudinal Studies; Predictive Validity; Predictor Variables; *Reading Achievement; Reading Comprehension; *Reading Research; *Reading Skills; *Skill Development; Spelling
IDENTIFIERS *Netherlands

ABSTRACT

From 1979 to 1985, data were gathered from approximately 600 students in 24 Dutch elementary schools to determine changes occurring in the interrelationships among the reading skill components of decoding, reading comprehension, and spelling ability. Information for each student was obtained from reading performance test scores recorded at the end of sixth grade. Results indicated that the decoding speed of students continued to develop over time, and that this reading skill component achieves a more independent status at the end of elementary education. Findings also showed that although the reading skill components were still correlated at the end of elementary school, the causal relationships among decoding speed and reading comprehension and spelling, respectively, seemed to lose a great deal of strength, whereas comprehension and spelling were more highly correlated. The best predictors of decoding speed and comprehension in sixth grade were the measures of the same reading skill components in the earlier grades. In addition, reading performance scores in the earlier grades played an important role in determining the level of secondary education for which the child was eligible. (FL)

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Development of Reading Skills in Dutch Primary Schools: Outcomes and Prospects

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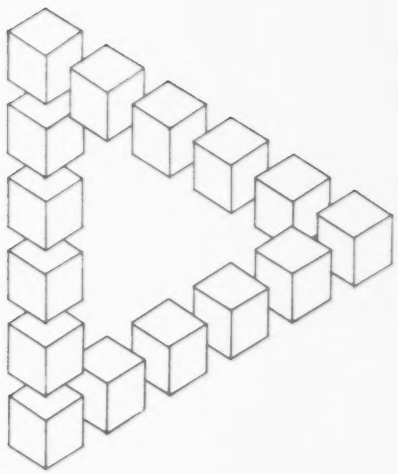
Paper presented on the 1986 AERA-Conference;
San Francisco, April 16-20, 1986.



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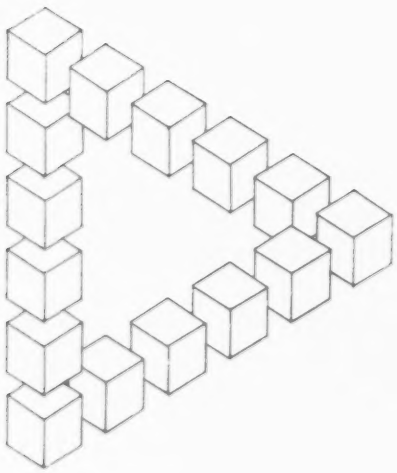
SUMMARY

From 1979 to 1985 a sample of Dutch elementary school students (24 schools; N= about 600) has been followed with respect to reading skill development. In this paper some results of this longitudinal study are presented, mainly concerning the changes in the interrelationships between decoding, reading comprehension and spelling ability during primary education.
The results indicate that decoding speed continually develops over time. Second, this reading skill component gets a more independent status at the end of elementary education. Although the reading skill components are still positively correlated at the end of primary school, the causal relations between decoding speed and reading comprehension and spelling ability resp. seem to have lost a great deal of their strength, whereas reading comprehension and spelling are more correlated. The best predictors of decoding speed and reading comprehension in grade 6 are the measures of the same reading skill component in the earlier grades. Finally, reading performance scores in the earlier grades play an important role in the level of secondary education the child is considered eligible for.



The vignette of this research project is a special version of an 'impossible figure' created by the Swedish designer Oscar Reutersvärd. © Symbol Design O. Reutersvärd. Used by courtesy of the artist.

The vignette represents the complexity of the interrelations between three reading skill components in the six years of elementary education.

INTRODUCTION

Before entering the complex area of reading skill development, we would like to make the reader somewhat more familiar to the Dutch school system. The conceptual framework (partly adopted from Malmquist (1969) and Dickes (1978)), which is presented in Figure 1 below, not only gives insight into the research design, but also offers a brief overview of the structure of Dutch elementary education. As is the case in many other countries, most Dutch elementary schools classify children by grades. For school purposes a year of progress within one grade is seen as comparable with a chronological year in a child's lifetime. In The Netherlands most children enter the first grade when they are approximately six years old after having been in kindergarten for two years. They leave elementary school at the age of eleven or twelve when they have completed grade six. The next step in their school career is the entrance into secondary education. If there are no severe problems, a child moves up to a higher class every year; sometimes however, when the pupil's progress is insufficient in the teacher's opinion, a child has to repeat a class. (1)

In our longitudinal research project a great number of children of 24 traditional Dutch elementary schools have been followed with respect to their reading skill development. From 1979 to 1985, data have been collected on many occasions concerning three reading variables viz. 1. reading fluency (decoding speed), 2. reading comprehension, and 3. spelling. The main block in figure 1 presents these variables and the several time points. Five exogenous variables which are assumed to be related to reading development, were also taken in account. After a six year's period of collecting, controling, arranging and analysing data, a comprehensive data base is available now in 1986. (2)

The title of this paper needs to be narrowed down. As it is evident that this paper cannot report, even in a global format, all results, we must confine ourselves to one main subject: the changes in the interrelations between the reading skill components during primary education. Based on the reading performance scores in grade six we look back to earlier grades and try to answer the question how reading skill develops. This is what is meant by the word 'outcomes'.
In two appendices we pay some attention to more specific issues which are not directly related to the research question itself. Apppendix A presents a graphic representation of the development of decoding speed. A distinction is made between children who have repeated grade 1 or grade 2, the so called 'behinders', and a group of students who never repeated a class, the 'proceeders'. Finally, Appendix B shows the impact of reading performance in the earlier grades of an elementary school on the level of secondary education the child is considered eligible for; hence the word 'prospects' in the title. (3)

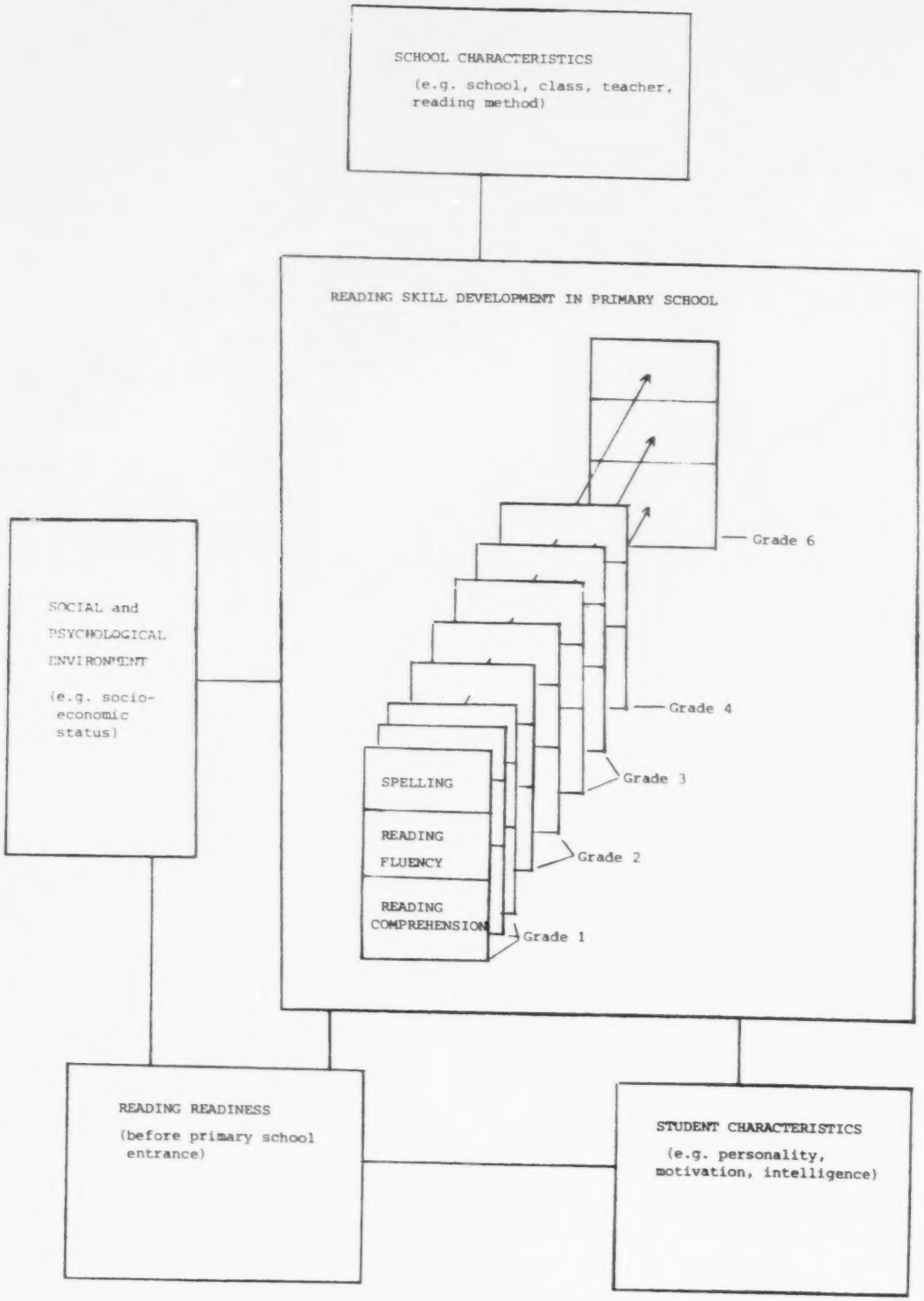


Figure 1. Conceptual framework

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THEORETICAL BACKGROUND

Two critical issues related to the subject of this paper will be discussed now. First, we would like to mention the adequacy of longitudinal research in general and more specifically in the study of reading skill development. Then we will try to legitimate our reading skill component approach while studying the interrelations between the several aspects of reading performance.

One of the main advantages of this research project is the (rather unique) longitudinal quality. Although longitudinal designs are tied with problematic aspects, there is enough evidence that a longitudinal approach and design can indeed reveal changes in reading skill development very well (Nesselroade & Baltes, 1979). Better than a cross-sectional design, a longitudinal study can give insight into causal relationships over a period of time (Goldstein, 1979).

With respect to the development of reading skills, Butler et al. (1985) carried out a longitudinal study to determine how well a broad, comprehensive battery of tests administered in kindergarten could predict reading achievement in grade 1 up to grade 6. The test variables were reduced by factor analysis to six predictive factors, which had, together with the child's sex and the parents' language, multiple correlations with reading achievement of about .71 across all reading achievements. Path analysis showed that sex and parents' language had little direct effect on any of the reading measures. Characteristics measured in kindergarten directly influenced reading performance in the early primary grades; early reading achievement was the best determinant of reading performance in the upper grades. Reading scores collected at any single time point during primary education were most directly, and strongly, related to reading achievement scores measured immediately before that time point. This suggests that the acquisition of reading skills follows a stable, smooth development pattern in which the acquisition of reading skills at any time point depends on the mastery of prior skills. Good readers in the early grades remained good readers during all six years of primary education (with the opposite holding for the poor readers). Nothing in their school experience could alter this situation (Butler et al., 1985).

Curtis assessed efficiency in verbal coding and listening comprehension in skilled and less skilled readers in second, third and fifth grades. She concluded that younger and less skilled readers differ from older skilled readers on both factors. However, as verbal coding speed increased, comprehension skill became the more important predictor of reading skill (Curtis, 1980).

In a longitudinal study of reading processes the developmental aspect is very important. Chall (1983) tried to solve the problem by introducing a stage model of reading development. Stanovich once argued for the need to incorporate a developmental component into mulivariate studies, because ".. it is likely that the relative importance of the various component processes of reading change as the general reading level of the sample under study increases". This brings us to a fundamental problem, viz. what precisely do we mean when using the concept 'development'? In this paper a limited aspect of the concept is used; we define development in terms of changes in scores on dependent reading variables. Progress and fall off thus mean gains and losses on test scores which measure operationalised reading variables. But even when the concept of development is defined like this, the problem still exists when speaking about reading comprehension.

Since there is no adequate theory and no clear definition of reading comprehension, a side-step is necessary. In this paper reading comprehension development will be interpreted as changes in relations among constituent elements or factors, specifically the influences of decoding and spelling ability on reading comprehension variables measured at several time points, under the assumption that the underlying concept of reading comprehension does not change over time.

Research on reading acquisition in the first years of primary school clearly indicates that reading skill may be 'unfolded' into three aspects or components viz. 1. reading fluency, in which decoding processes play an important role, 2. reading comprehension, the process of attaching meaning to printed or written symbols, and 3. spelling, the knowledge of orthographic structure of words (cfr. Stanovich, 1980; Curtis, 1980; Frederiksen, 1982). This triad is relevant, even when we hold in mind that spelling ability by itself is, strictly speaking, not a reading variable.

Let us first look at the decoding component. In the first years of reading instruction decoding skills play a very important role. By using visual or phonological cues children build up a reservoir of word representations which is stored in the internal lexicon. Several studies deal with differences between good and poor readers in using an adequate (less time consuming) strategy (e.g. Perfetti & Lesgold, 1979; Perfetti, 1985; Seegers, 1985). It should be clear that decoding processes in the long run should develop automatically in order to create time for the essential reading task: to comprehend what is read. As far as the relation between decoding and reading comprehension is concerned, Horowitz & Samuels (1985) wondered if a poor reading comprehension might be the result of a general comprehension problem, a decoding problem, or a combination of the two. They did not find significant differences on a listening comprehension task between good and poor readers in grade 6, neither on easy nor on difficult texts. The conclusion, therefore, was that the reading comprehension problem experienced by the poor readers was due, at least partly, to a decoding problem.

Research on the structure of the second component, reading comprehension, is rather controversial. Rost (1985) reviewed 25 studies and concluded that silent reading comprehension - at least of fluent readers - could be adequately described in terms of only one, or at most, two dimensions: general versus literal and/or inferential comprehension. It was suggested to view reading comprehension as a verbal problem solving process, with close relationships to vocabulary and verbal reasoning (Rost, 1985, p. 68). Andrich & Godfrey (1978) examined the Davis Reading Skill Tests in an attempt to determine whether there was one single, or two or more reading comprehension factors. They argued that the controversy could be resolved by using a latent trait model. From one point of view ('reading comprehension is a single factor component') the results showed that 76 of 96 items in the test conformed the Rasch latent trait model; from another perspective the same results could be interpreted as representing different levels within one hierarchical structure.

With respect to the relation between reading and spelling, Massaro & Taylor carried out a perceptual recognition task with three groups of sixth graders and one group of college students. The effect of orthographic stucture on perceptual recognition was 16% for adults, 10% for good and average sixth grade readers and only 6% for the poor readers (Massaro & Taylor, 1980; Massaro, 1984). Other research findings indicate that spelling and reading are indeed related, especially in the early grades. Shanahan (1984) found that phonics knowledge is the most important aspect of reading that relates to writing performance for beginning readers. The ability to spell accurately and the ability to apply basic phonics rules in decoding, are closely related. If the relation was causal, spelling instruction would have great impact on reading achievement. As students become more proficient readers, the nature of the reading-writing

relation changes. Shanahan suggests that future research in this field should try to study these changes.

These and other studies demonstrate a significant relationship between reading ability and knowledge of orthographic structure. We cannot, however, deduct from this research how important utilization of orthographic structure knowledge is for good reading. Good readers may read better because they have learned to use orthographic structure; it is also possible that sensitivity to orthographic structure depends on the rate of skilled reading. It seems worthwhile to explore the relations between reading and spelling skills.

We now turn to our own research on the relations between the reading skill components in the first years of elementary education. We analysed the development of reading skills in grade 1 up to grade 3 of primary school; these analyses have yielded some remarkable results. Figure 2 shows - in condensed form - the relationships between word recognition (decoding speed), reading comprehension and spelling in grades 1 to 3. In a pre-investigation the data of half of our sample were analysed, so that a later comparison is possible. *)

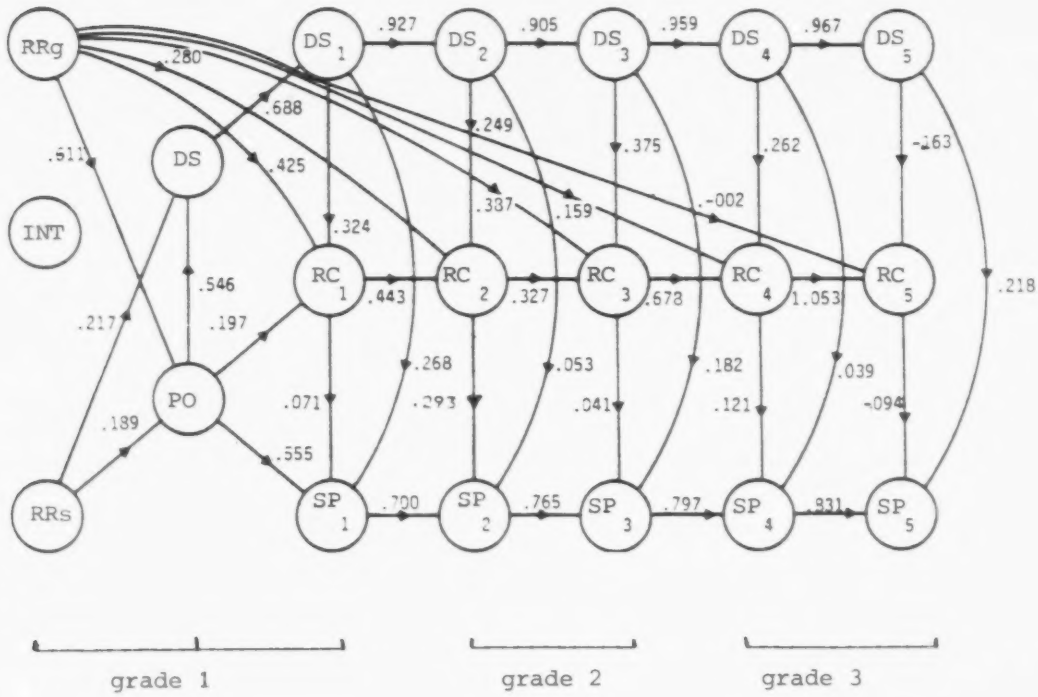

Figure 2. Relations between decoding speed (DS), reading comprehension (RC) and spelling (SP) in the first three years of elementary school.

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*) The authors wish to thank Drs. J. van Leeuwe for his methodological support.

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Here three latent variables (factors) are postulated: decoding speed or word recognition (DS), reading comprehension (RC) and spelling (SP). The arrows indicate the causal relationships that were assumed; the numbers are the standardised path-coefficients which give an impression of the strength of the relation. The five variables on the left represent three reading readiness factors: RRg (general reading readiness), INT (intelligence measures) and RRs (specific reading readiness), all three factors measured at the start of primary school, and two decoding factors measured after 4 months: PO (decoding power) and DS (decoding speed). For more details we would like to refer to Mommers et al. (1986).
Figure 2 is the graphic output of a Lisrel V procedure (Jöreskog & Sörbom, 1981). Important with respect to further analyses are the values of the path-coefficients. The relationships within one latent variable at several time points (the horizontal arrows) are very high and what is more, they even increase over time. The strength of the relation between variables (represented by the vertical arrows) is much lower and even seems to diminish in grade 3. In other words, the three components of the reading process are losing their interdependence. The latent variables seem to become more and more independent. But then the question arises: what happens in grade 4 up to grade 6?

Two last issues under study are of more practical importance. The first deals with the development of decoding skill all over the years of primary school, and more specifically with the differences in decoding skill development between students who have repeated a class in the first phase of elementary school and students who have not. The second issue deals with the impact of reading skill performance in the first grades of primary education on the school career in secondary education. Being a good or at least a sufficient reader is a necessary prerequisite for a succesful school career. The level or type of secondary education children are considered eligible for could be highly correlated with reading ability in elementary school. One question is to be answered: what impact do reading ability scores in the first years of primary school have on the assignment to the different levels of secondary education? Research on this field indicates a strong influence of general scholastic ability and socio-economic status (for the Netherlands: Blok & Saris, 1982), but what about the specific reading performance contribution to the conglomerate of all scholastic abilities?

The issues presented above, accompanied by a selection of recent research, lead to the following main research question:
How does the interrelationship, interpreted here as causal influences, between decoding, reading comprehension and spelling ability change during elementary education?

In two appendices we pay attention to some secondary questions:
A. Can we describe in an adequate way the development of 'technical reading processes' (decoding and word recognition) in the six grades of primary school?
B. What is the relation between reading performance scores in grades 2 and 3 and the assignment to different levels of secondary education?

METHOD

A. SUBJECTS.

Subjects in this research project were the students of 24 traditional Dutch primary schools. About 55% of these students were boys. The project started in August 1979 with a cohort of 582 children. After 6 years 398 of them were still in the sample (= 68.4%). Most of the 184 'missing cases' in the 1985 cohort had left school (removal) or failed because they had to repeat a class. The total number of students ever involved in this project was 872. (2)

B. INSTRUMENTS.

Many reading tests and other instruments were selected or constructed for this project. We now give a brief overview of some instruments which are relevant for the research questions formulated above.

A. Technical Reading (TR); decoding- and reading fluency tests:
   A-1) The EMT (One-Minute Test). This test measures the decoding speed. Raw score is the number of words which a student can read correctly within one minute from a list of 116 words. In The Netherlands the EMT is widely used as a measure of technical reading ability.
   A-2) The AVI-test. Contrary to the EMT the AVI-test (also a speed test) measures decoding speed in reading sentences.

B. Reading Comprehension (RC).
   B-1) In grade 2 and grade 3 this variable was measured by reading comprehension tests constructed by the National Institute for Educational Measurement (CITO).
   B-2) Reading comprehension in grade 6 was measured by:
      - Woordenschattest; (Vocabulary test)
      - Hoofdgedachtetest; (This test measures the ability to pick up the main concept of a short story.)
      - a Cloze Test for Reading Comprehension;
      - an ISI-subtest Reading Comprehension;
      - two CITO-Reading Tests; (two reading tests which measure reproduction and conclusion ability when reading short stories.)

C. Spelling ability (SP).
   C-1) - The spelling ability was measured by a number of dictations.
      Some tests were selected (ISI- and CITO-subtests); others were especially constructed for this project.

Besides the reading tests described above, two standardized Dutch intelligence and general scholastic ability tests were administered viz. the ISI (with 11 subtests) and the CITO-Eindtoets 1985 (with 19 subtests). In the Netherlands the ISI and CITO-Eindtoets are the tests mostly used for general scholastic ability. The CITO score plays an important role in the assignment to secondary education. Both ISI and CITO-Eindtoets are very well suited to measure levels of progress after six years of primary school.
All tests used were carefully selected or constructed. All tests were reliable and valid.

PROCEDURE

The tests were administered by a team of well-trained research assistants (graduate and undergraduate students of Educational Sciences) on the following time points:

Date	Time point	Grade	Period
Aug. 1979	1	1	Shortly after entering primary school
Dec. 1979	2	1	After 4 months in grade 1
April 1980	3	1	After 8 months in grade 1
Sept. 1980	4	2	Start grade 2
April 1981	5	2	Middle/end grade 2
Sept. 1981	6	3	Start grade 3
April 1982	7	3	Middle/end grade 3
Sept. 1982	8	4	Start grade 4
Sept. 1984	9	6	Start grade 6
April 1985	10	6	Middle/end grade 6

The interval between the time points is rather short in grade 1 because of the rapid development of reading skill in the first grade.

RESULTS

Before analysing the changes in interrelations between the reading skill aspects over time, we present a global overview of the relations at the end of primary school.
Let us first look at the situation at the start of grade 6. Figure 3 is the graphic representation (an ALSCAL-output) of the relation between several variables at this time point. Here the ranks of the intercorrelations between eleven reading and verbal intelligence tests have been transformed into a distance model. A relative large distance between a pair of variables correspondends with a small positive correlation (cf. Schlesinger & Guttman, 1969). Important in this analysis is the fact that negative correlations do not occur.

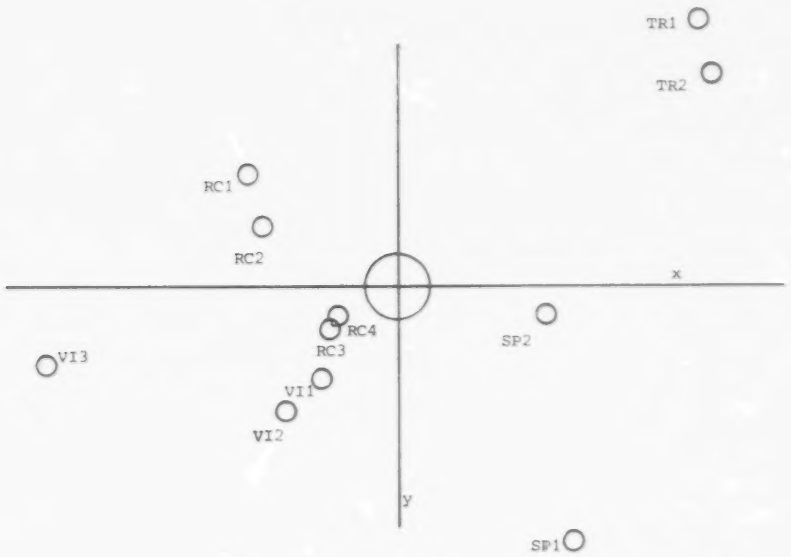

Figure 3. Intercorrelaties between 11 reading and verbal intelligence tests in Grade 6.

A short explanation:
TR1 and TR2 are two decoding tests. TR1 is the EMT (One-Minute Test) mentioned before and TR2 is a parallel version of it.
RC1 is a Reading Comprehension test (Hoofdgedachte, Main Item test).
RC2 is a ISI Reading Comprehension subtest.
RC3 is the Cloze test for Reading Comprehension.
RC4 is the Vocabulary test (Woordenschat).
SP1 and SP2 are two spelling tests (dictations).
VI1, VI2 and VI3 are three ISI verbal intelligence subtests.

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As other analyses pointed out (factor and cluster analyses), in grade 6 the relevance of discriminating between the three latent variables decoding, reading comprehension and spelling still exists. Figure 3 clearly shows three clusters, a TR cluster, a RC and VI cluster, and a SP cluster. It is not surprising to see that the verbal intelligence tests and the reading comprehension tests are neighbours. The TR and SP tests appear on the righthand side of the Y-axis. The distance between spelling and reading comprehension (and the opposite holds for the correlation) is smaller than the distance between decoding (TR) and reading comprehension. This supports the assumption that decoding skill more and more gets an independent status, whereas spelling and reading comprehension seem to be more correlated.

Analogously to the example in the section theoretical background, we can analyse the change in interrelationship occurring within a given period of time by means of a general Lisrel model (Analysis of Linear Structural Relationships by Maximum Likelihood and Least Square Method; Jöreskog & Sörbom, Version VI, 1983). It is possible to postulate a model and to determine whether, and to what extent, the data support the model. Indices for a good fit of the model are the ratio chi-square/degrees of freedom and the goodness-of-fit index. Figure 4 presents an interim result; here two time points are under study: grade 3 (end) and grade 6 (start). The analyses were carried out on the data of half of our sample: the same sample was used in analyses before (Figure 2). Therefore, the results may be compared.

Note: Variables in circles represent postulated latent variables; variables in squares represent observed variables.

TRw3 = Decoding skill (words) - grade 3
TRs3 = Decoding skill (sentences) - grade 3
RC3 = Reading Comprehension - grade 3
SP3 = Spelling ability - grade 3

TR6 = Decoding skill (words) - grade 6
RC6 = Reading Comprehension - grade 6
SP6 = Spelling ability - grade 6

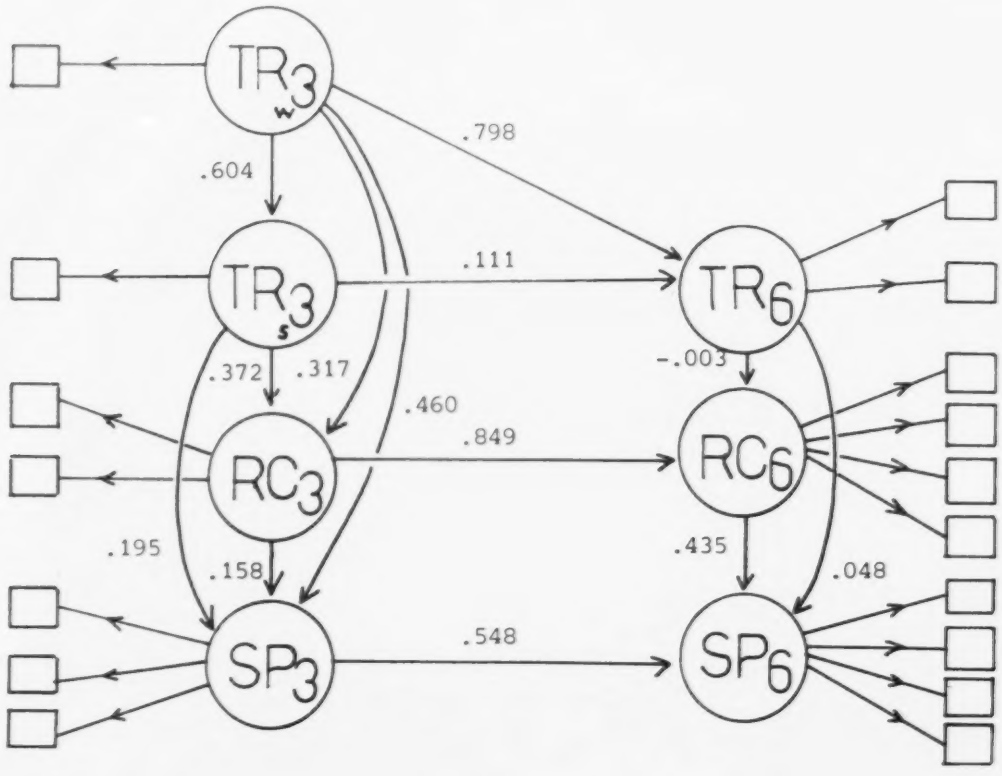

Figure 4. Relations between decoding (TR), reading comprehension (RC) and spelling ability (SP) - Grades 3 and 6 - (N=178)

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With 56 degrees of freedom chi-square= 91.95 ,(p= .002). The goodness-of-fit index = 0.930. Although this goodness-of-fit index is quite high, the chi-square/degrees of freedom ratio is not quite satisfying. However, if we do consider a ratio chi-square/degrees of freedom of 2:1 as the limit to be satisfying, this model is appropriate. The high path-coefficients in the relation TRw3-TR6, TRw3-TRs3 and RC3-RC6 are conform the assumption that there is a strong relation between decoding resp. reading comprehension in grades 3 and 6. The lower coefficient between SP3 and SP6 is unexpected. The very small coefficients between TR6 and RC6, resp. between TR6 and SP6, confirm the idea that at the end of primary school decoding processes are rather independent: decoding or reading fluency has established itself as a more or less discrete, independent factor.

What happens when we use the data of the entire sample (N=367), is presented in the next figure. Here, again, 17 reading variables were taken in account. Looking at Figure 5, we can conclude that the model is quite stable: the path coefficients do not differ very much from those displayed in Figure 4. With 109 degrees of freedom the chi-square value was 216.87, (p=0.000); the goodness-of-fit index was .935.
Again, the relation between decoding measures in grade 3 and grade 6 is rather strong and the same holds for the reading comprehension component. In grade 6 the causal relation between decoding and reading comprehension is very weak (if a relation from decoding to reading comprehension is assumed, the value of the path coefficient is not significant) and the coefficient from decoding to spelling ability is, although significant, also rather small. The relation between spelling ability and reading comprehension (both measured in grade 6), does not differ (speaking in terms of the value of path coefficients,) from the relation between spelling ability measured in grade 3 and grade 6 respectively.

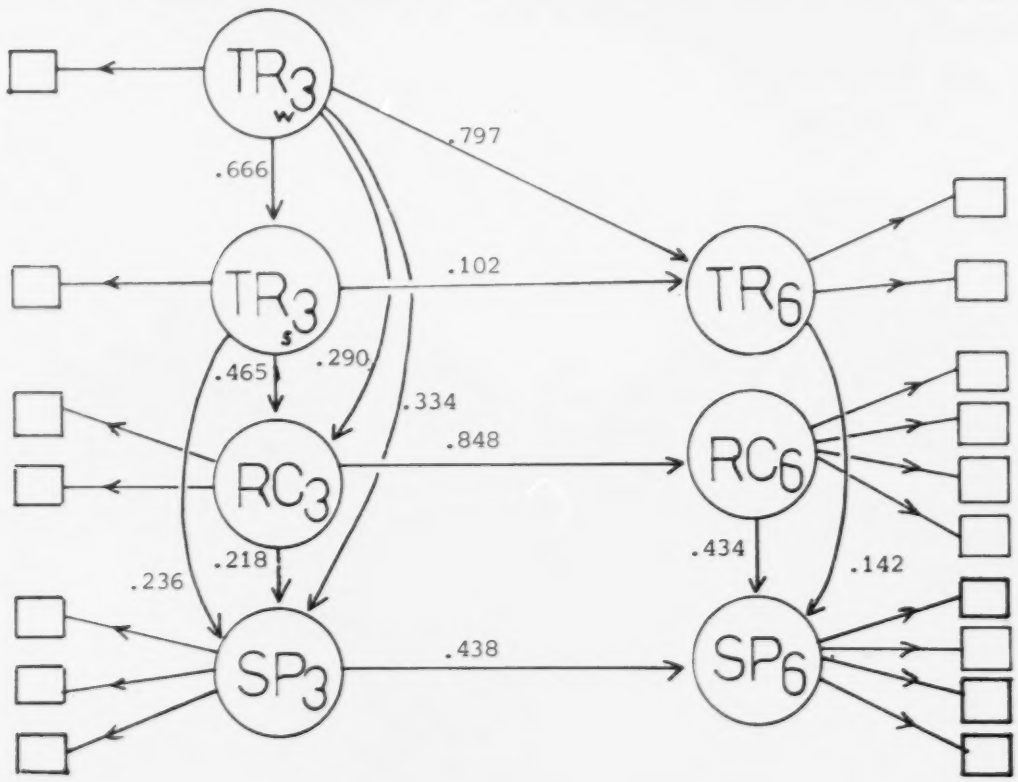

Figure 5. Relations between decoding (TR), reading comprehension (RC) and spelling ability (SP) from Grade 3 up to Grade 6. (Whole sample; N=367)

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DISCUSSION

Before returning to the research questions and before summarizing and interpreting the results, we would like to emphasize the limited character of this study. Although we studied the reading skill development of a rather big sample of elementary school students for six years, remarks which claim some general validity should be made very carefully. Yet, as far as the Dutch situation is concerned, some conclusions are possible.

In grade 6 all reading components were positively correlated. There is, however, enough evidence that the technical reading component (decoding) has lost its impact - at least for a great deal - on reading comprehension and spelling ability. Our findings with respect to the sixth grade situation do not support Horowitz & Samuels' (1985) thesis that reading comprehension problems are partly due to decoding problems.

The results are in line with some of Butler c.s.' findings (Butler et al., 1985). In general the best predictor of reading performance on any reading component is the reading achievement score on the time point just before; e.g., spelling ability in grade 3 is best predicted by spelling ability in grade 2. However, this conclusion has to be revised, as our findings demonstrate, when interpreting the results in grade 6. Spelling ability in grade 6 was equally well predicted by reading comprehension in grade 6. As far as decoding and reading comprehension are concerned, Butler c.s. may be right; the best predictor of decoding in grade 6 is decoding in grade 3 and the same holds for the reading comprehension component.

There is some support for the idea that reading comprehension can indeed be described as a single factor component as Rost (1985) stated. All reading comprehension variables and verbal intelligence measures were highly correlated; reading comprehension, vocabulary and verbal reasoning are strongly related.

Other analyses of the relation between reading comprehension and spelling, (not presented here,) showed that the unique contribution of reading comprehension in predicting spelling ability, both measured in grade 6, was greater than the unique contribution of spelling ability in grade 3 in the explanation of the spelling variance in grade 6.

Still, the relation between reading comprehension and spelling ability is not quite clear. Frith (1980) once wondered whether reading a word and knowledge of the orthographic structure of words were two sides of one coin. Perhaps reading comprehension and spelling in the upper grades both appeal to the same process: access to stored mental representations in combination with an adequate use not only of syntactic, but also of semantic and other information sources. Another reason for the unexpected complexity of the relation between reading comprehension and spelling might be the fact that one or both variables are not operationalised and measured correctly. For example, does reading comprehension, in grade 6 as well in grade 3, call upon the same processes? This question cannot be answered here; a theoretical conceptualizing of reading comprehension is still lacking.

Another point of discussion is the question in what way and to what extent these Dutch findings apply to reading processes in other countries and to other educational systems. Differences in the educational system and especially in reading instruction may play a very important role, and the same holds for differences in operationalizing and measuring reading variables. Basic reading processes in primary education, however, are not restricted to one educational system. As a lot of research has shown, most of the issues presented here are discussed all over the world, and relevant in any educational system. Notifying what happens in reading research in other countries at least can give more theoretical and practical insights into this complex field of research.

The finding resulting from analysis of the third research question (presented in Appendix B) has some practical implications. The results pointed out that reading performance in the first grades plays an important role in the student's school career after primary education, at least in the assignment to the different levels of secondary education. This confirms our common sense ideas about the importance of being a good reader. Here these ideas have got a more concrete and factual status. The results also indicate that the quality of reading instruction should be a matter of continuing concern. The importance of good reading instruction all over the years of primary education should not be underestimated.

A final remark to conclude this section.
Doing research in the field of reading skill development is a wonderful and satisfying undertaking. It deepens the theoretical insight into the complex reading process and sometimes it gives an answer to questions of people who are responsible for the education of young children: teachers and parents. In our view, researchers should join those who try to help children to reach the goal set by the title of the NSSE-1983 yearbook: to become a good reader in a complex society.

Notes:

(1) From the start of the school year 1985/86 the structure of the Dutch elementary school system has been changed drastically. The two years kindergarten period has now been incorporated into the formal elementary school.

(2) At any single time point the loss of data was minimal (1-3%), but when data on several time points have to be analysed in a longitudinal design, some loss of data is inevitable, since some analysis methods do not allow missing cases even on one of more time points.

(3) The word 'assignment' should be read as synonymous with the word 'advice'. In most cases parents follow the school's advice, but this advice does not restrict their freedom in choosing the type or level of secondary education which they prefer.

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APPENDIX A. The development of decoding speed.

Figure 6 shows the development of the technical reading skill from grade 2 up to grade 6. The dependent variable is the decoding skill as measured by the EMT (One-Minute-Test). This test can be administered in all years of primary school. When interpreting the test scores, it should be noted that the items (the words that are to be read aloud) increase in length and difficulty rate, e.g. more complex cvc-combinations at the end of the list. In Figure 6 the means and range of raw test scores on any of the six time points are plotted. Using the TIDA-program (Time Data Analysis Program; Oud, Relick & Raaymakers, 1985) a so called growth curve could be printed through the data. Based on the components of the polynomial curve (here: linear, quadratic and cubic) this growth curve has been estimated by the program. For the sake of comparison, we distinguised the group students who have repeated grade 1, the 'behinders'(N=27), from the group of 'proceeders' (N=397), students who have not. Decoding measures for grade 1 could not be used here, because those tests are restricted to one special reading instruction method; not all of our students in the sample, however, received the same reading instruction in grade 1.

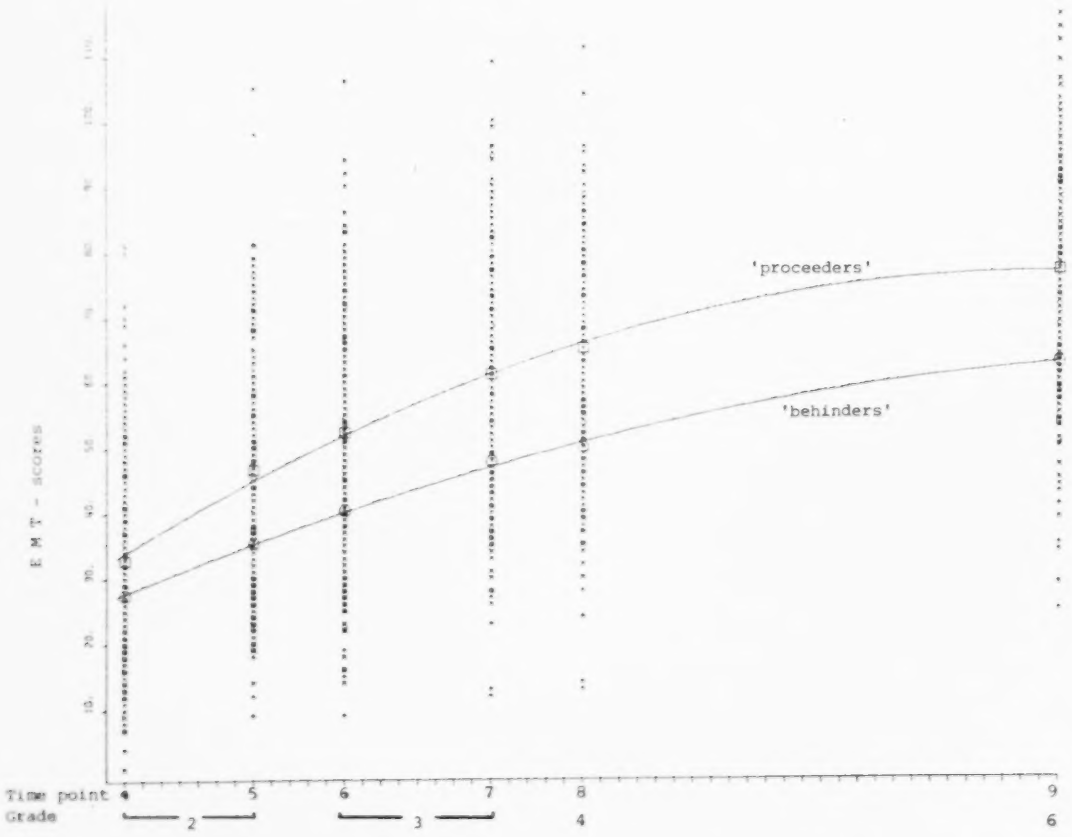

Figure 6. The development of decoding speed; grade 2 - grade 6

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To complete this part of the results we present means and standard deviations on the six time points.

Table I. Means and standarddeviations of EMT-scores.

	'Proceeders' n1=397		'Behinders' n2=27	
	X	Sd	X	Sd
Grade 2 (begin)	32.8	13.4	26.8	16.7
Grade 2 (end)	46.8	13.8	35.2	19.2
Grade 3 (begin)	52.5	14.0	40.1	21.3
Grade 3 (end)	61.4	13.4	47.1	20.1
Grade 4 (begin)	65.2	12.9	49.4	28.0
Grade 6 (begin)	77.0	12.2	62.0	20.1

Note: the maximum possible score is 116.

With respect to the results presented in Figure 6 and Table I the following remarks can be made.

a) Even after the start of grade 4, when reading instruction has shifted from decoding to reading comprehension, we can observe a remarkable progress in both groups.

b) The mean differences between the two groups increase up to grade 4, and then they stabilize. In grade 6 the 'proceeders' seem to have lost some of their lead.

c) The score variation in both groups is rather high at any time point. There is a large overlap between the two groups.

d) The overall mean score in grade 6 is 76. This means that an 'average' child can read about 76 (two- and three-syllable) words within one minute.

e) Looking at the low scores in each group (analyses are not presented here), we can see that, for the group of students who did not repeat grade 1, 84% of the scores at the start of grade 2 fall below a value of 47 which is about one-and-a-half Sd less than the mean score in grade 6. Having arrived in grade 6, only 3 children (less than 1%) fall within this lowest category. At the start of grade 2, 89% of the 'behinders', the children who have repeated grade 1, have scores lower than 47. But in grade 6, 25% of these children still have scores in this low category. They have made no significant progress and they have not reached a sufficient level of reading fluency.

APPENDIX B. The impact of reading performance on the assignment to secondary education

To investigate the influence of reading performance in the earlier grades of Dutch elementary schools on the assignment to different levels of secondary education, we first look at the Dutch situation. In the Netherlands there are, roughly spoken, three levels of secondary education: lower, middle and higher secondary education. They are comparable with Technical, Secondary Modern and Grammar Schools in Great Britain, and Hauptschule, Realschule and Gymnasium in West-Germany. In The Netherlands a student is, after having completed grade 6 of an elementary school, assigned to one of the three levels of secondary education by the school(director). In this assignment, factors like general scholastic ability, intelligence, motivation etc. play an important role. (3)

Table II shows a cross table with predicted and actual, observed assignments. Predicted here means a prediction based on reading performance scores at the end of grade 3. Using a discriminant analysis method, a linear classification function is created which predicts and classifies best the level of assignment (cf. Huberty, 1984).

Table II. Predicted and observed assignments to secondary education.

		PREDICTED assignment			
		low	middle	high	
OBSERVED assignment	low	84	36	15	135
	middle	42	82	64	188
	high	6	19	117	142
		132	137	196	465

Reading scores in grade 3 classify 84+82+117=283 of the 465 students into the correct level (= 61%). Best contributors in the classification function are the reading comprehension tests.
Of interest are the 'mispredicted' children. Six children, as Table II shows, were actually admitted to higher secondary education, whereas reading scores in grade 3 predicted low secondary education. These children had above-average scores on the verbal and non-verbal intelligence tests. Most of them had a high socio-economic background. The 15 students predicted in the high secondary education group, but assigned to a low level by the school, all came from families with a lower socio-economic status. These students did not differ on reading scores in grade 6 from the 6-students-group mentioned before.
The most important aspect of this analysis is the fact that reading performance in grade 3 could give a correct prediction in 61% of all cases. The same analysis with reading scores in grade 2 (a year earlier) as the predicting variables, resulted in a correct classification of about 54%; reading performance in grade 6 could correctly classify 67% of the students.

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